Naval Research Laboratory

Stennis Space Center, MS 39529-5004

NRL/MR/7440--03-8713

Digital Mapping, Charting, and Geodesy Analysis Program (DMAP)
Technical Review of NATO Standardization Agreement 1059–Letter Codes for Geographical Entities

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November 10, 2003

20040114 042

REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing this collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden to Department of Defense, Washington Headquarters Services, Directorate for Information Operations and Reports (0704-0188), 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to any penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number. **PLEASE DO NOT RETURN YOUR FORM TO THE ABOVE ADDRESS.**

1. REPORT DATE *(DD-MM-YYYY)*	2. REPORT TYPE	3. DATES COVERED *(From - To)*
November 10, 2003	Memorandum	

4. TITLE AND SUBTITLE	5a. CONTRACT NUMBER
Digital Mapping, Charting, and Geodesy Analysis Program (DMAP) Technical Review of NATO Standardization Agreement 1059–Letter Codes for Geographical Entities	5b. GRANT NUMBER
	5c. PROGRAM ELEMENT NUMBER 0603704N

6. AUTHOR(S)	5d. PROJECT NUMBER 74-7441-B3
John L. Breckenridge and Kevin B. Shaw	5e. TASK NUMBER
	5f. WORK UNIT NUMBER

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)	8. PERFORMING ORGANIZATION REPORT NUMBER
Naval Research Laboratory Marine Geosciences Division Stennis Space Center, MS 39529-5004	NRL/MR/7440--03-8713

9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES)	10. SPONSOR / MONITOR'S ACRONYM(S)
SPAWAR PMW 150 4301 Pacific Highway San Diego, CA 92110	SPAWAR
	11. SPONSOR / MONITOR'S REPORT NUMBER(S)

12. DISTRIBUTION / AVAILABILITY STATEMENT

Approved for public release; distribution is unlimited.

13. SUPPLEMENTARY NOTES

14. ABSTRACT

The use of the North American Treaty Organization (NATO) Standardization Agreement 1059–Letter Codes for Geographical Entities offers a common agreement of a two-digit character string to identify world countries (e.g., US=United States, GB=United Kingdom). In April 2003, NATO released STANAG 1059 (8th Edition), which effectively updated these country codes to a three-digit entity so that further definition of country provinces could be provided within these attributes. For example, the new code for the US includes identifiers for individual states and commonwealth areas such as the code 'US-MS' representing 'United States - Mississippi.' Although many might welcome the expansion of this code as an enhancement of the information, some users of legacy software and database systems with source code structured to the two-digit code may view it differently.

15. SUBJECT TERMS

NATO Standardization Agreement 1059–Letter Codes for Geographical Entities

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON John L. Breckenridge
a. REPORT	b. ABSTRACT	c. THIS PAGE	UL	10	19b. TELEPHONE NUMBER *(include area code)* (228) 688-5224
Unclassified	Unclassified	Unclassified			

Standard Form 298 (Rev. 8-98)
Prescribed by ANSI Std. Z39.18

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Technical Review of NATO Standardization Agreement 1059 – Letter Codes for Geographical Entities

1.0   Background

The use of the North American Treaty Organization (NATO) Standardization Agreement 1059 – Letter Codes for Geographical Entities offer a common agreement of a two digit character string to identify world countries (e.g., US=United States, GB=United Kingdom). In April 2003 NATO released STANAG 1059 (8th Edition) which effectively updated these country codes to a three-digit entity in order that further definition of country provinces could be provided within these attributes. For example, the new code for US includes identifiers for individual states and common wealth areas such as the code 'USMS' representing 'United States Mississippi'. Although many might welcome the expansion of this code as an enhancement of the information, some users of legacy software and database systems with source code structured to the two-digit code may view it differently.

The following NATO excerpt offers an understanding of the **"The NATO Standardization Organization (NSO)**. The NSO comprises the NATO <u>Committee for Standardization</u>, the NATO <u>Standardization Staff Group</u>, and the NATO <u>Standardization Agency</u>. Its role is to enhance interoperability and in order to contribute to the ability of Alliance forces to train, exercise and operate effectively together, and when appropriate, with forces of Partner and other nations, in the execution of their assigned tasks. It undertakes this by initiating, harmonizing and coordinating standardization efforts throughout the Alliance and providing support for standardization activities. In accordance with Alliance policy, national and NATO authorities are encouraged to develop, agree and implement concepts, doctrines, procedures and designs which will enable them to achieve and maintain interoperability. This requires the establishment of the necessary levels of compatibility, interchangeability or commonality in operational, procedural, materiel, technical and administrative fields [1]."

This document provides considerations of the impacts to adopting the STANAG 1059 (8th Edition) in Navy legacy software and database systems requiring country data codes. It offers recommendations as to enhancements that might be made at both the legacy system, and/or the database format level to compensate for difficulties encountered in utilizing the new three digit codes.

2.0   Discussion
2.1   Considering Impacts on Navy Legacy Systems

Space and Naval Warfare Systems Command (SPAWAR), Code 150 has noted numerous Navy systems (e.g., TAMPS, PFPS, JMPS and CMDL) that might be seriously affected just by changing the country codes within one data system like the Digital Aeronautical Feature Information File (DAFIF) to require it to access the STANAG 1059 three digit codes. It is necessary to acknowledge that as a Standard Product of the National Imagery

and Mapping Agency (NIMA), DAFIF is structured according to an official NIMA Product Specification [2]. Regardless of any other perspective taken in examining an issue like STANAG 1059 impacts, one rule must remain constant; Naval Systems are required to use these products in accordance with the published product specification. This means that in accordance with the DAFIF Specification General Definitions, "Country Code is a two letter country identification code as designated by the Department of State..." [3]. It is assumed that when the U.S. is participating in NATO governed operations, the Department of State will designate whether STANAG 1059 applies as the source for this two letter country identifier. Therefore, it is also noted that the scope of this examination of the STANAG 1059 would only apply to instances when the U.S. is participating in official NATO operations, and/or a particular system and/or product specification voluntarily references NATO STANAG 1059 as its source for country codes data. In the case of DAFIF, the specification requires that the data be a two-letter code.

At present, DMAP is not directly cognizant of any particular Naval systems utilizing the STANAG 1059 two-letter country code, though we would expect that an investigation of this issue would reveal a substantial number [4]. Such an investigation may be deemed necessary in the event that NATO ratifies the proposed changes to STANAG 1059. General knowledge of the technical issues common to computer programming would suggest that most of the systems using the old two-letter format would be adversely affected to some degree by the introduction of the new three-letter code. Any systems using the two-digit code currently look for a specific data file and expect to parse it based upon its published format (i.e., character strings of two-letters). Obviously, the worse possible impact from implementing a three-letter code in these systems is that the source code would no longer properly access the country code data in its original format. Thus, the result would make it impossible for the legacy code to execute the function of retrieving a country data code in relation to other associated attributes. This would also mean that the execution of the source code routine would be halted and subsequently it would not be able to read any additional characters in the remainder of this string (e.g., USMS12345).

2.2 Possible Methods for Adjusting to Three Digit Codes
Several options could be used to update legacy systems for handling new country codes, of which all require some level of rework or addition of new source code. These options fall within three primary categories, including: 1) implementing modifications and/or new source code to existing software systems, 2) restructuring the new data within a more intelligent (i.e., object oriented) data structure to allow additional functionality in the data, and 3) revising the STANAG update process to allow Navy Systems a longer transition path.

2.2.1 Implementing Modifications to Existing Code and/or Adding New Source Code Functionality
To offer a software-based remedy to this situation, one will need to determine a way to allow the three-character code to reside in the legacy system without impacting other data or software functions. In the case of DAFIF, SPAWAR Code 150 has indicated that,

"For Airports (and Heliports) the country code is the first 2 characters of the NIMA key field named Airport Ident (i.e., US12345). This field is used in all the Airport (and Heliport) sub tables (i.e., runways, arresting gear, terminal procedures/SIDs/STARs, etc)" [4]. Placing a three-digit code directly in this location would make it impossible for the existing code to function properly on the remainder of the string. Therefore the existing code would need to be modified to read the third character and either discard the last digit, so as to refer to the old version of the country code, or to reference the full three-digit code. This type of software modification can be very costly due to the time and expense involved in tracing the affects of this action to determine if it causes any 'down-stream' conflicts (i.e., residual actions) within the existing software.

Another method requiring implementation of new code would be to allow the introduction of middle-ware (i.e., go-between software) that performs a function of reformatting the new 3-digit code to make it appear as the original two digit data. In the case of the DAFIF file, the middle-ware would function to strip away the extra character string. It would be executed at the original point of execution where the software calls for additional airport data.

Finally, one more method would be to provide a translation table that maps the new three-character code into a unique two-character code and then stores a "new" two-character index code currently not in use as a country code into the data field. This code is then used to look up correct data value in the translation table. This effort amounts to a temporary measure that might be used until new source code can be implemented to directly support using the STANAG 1059 three-character code.
NRL recommends that a small demonstration project be launched to develop strawman tools or extensions to model the three techniques mentioned above relative to developing new code or modifying existing code: 1) new/edited source, 2) adding middleware, and/or 3) adding a translation file.

2.2.2 Restructuring the Country Code Data to Offer More Intelligent Functionality to the User

The use of more intelligent data structures, (e.g., object-oriented paradigm) can provide many functional enhancements over data structures developed with conventional languages (e.g., Fortran, C). Some concepts included in these structures are encapsulation (re: an objects local state and the operations by which it can be accessed), inheritance (re: ability for new objects to take on the characteristics of parent objects), and finally polymorphism (re: many objects responding to the same message). These structures can supply additional utility in the form of advanced data definitions, (e.g., 'state' and 'operation') directly at the data level. Utilizing these concepts to build a 'smart' country codes data set could include rules concerning the format in which the data must be presented to different types of Navy systems. As a software function calls these smarter data objects containing the country code, the object might include operations that structure the data according to the format expected by that system. This could have significant benefits in insuring that both two and three-digit codes would be available from the same data structure to prevent the need for storing multiple data sets. Since it is unclear as to whether this could be accomplished without the use of middle-

ware, more investigation would be needed concerning these concepts. NRL recommends that N096 consider authorizing further study on the use of advanced data structures designed to enhance the referencing of the country codes data set within existing software systems.

2.2.3 Re-examining the Update Process for STANAG Implementation by Navy Systems

The NATO Standardization Agreement (STANAG) represents agreements of standardization developed and encouraged by the NATO Agency of Standardization. It encourages the formulation, agreement, implementation and maintenance of standards governing the use of equipment and procedures throughout NATO.

One difficulty in implementing any standard relates to the amount of lead-time given to the recipient of the standard, in this case the U.S. Navy. Standards generally require some amount of effort to implement. In the case of legacy systems that are governed by the Program Objective Memorandum (POM) cycle for systems acquisition and update, determining an opportune time to implement a new system function can be very constrained by the budget cycle. Therefore the length of time preceding the full implementation of such a standard can be crucial to the successfulness of a particular system in implementing the changes required by the new standard. In the case of a NATO STANAG, the final release might need to take into consideration the systems expected to use it by announcing it with a pre-release notice.

Since this is an area where the level of Navy participation is not known, more investigation is needed to further determine the need for making a recommendation to change the current process. NRL recommends that DMAP conduct a more formal investigation into possible improvements needed to the NATO STANAG with reference to geospatial data standards and the issue of providing an improved process to allow Naval Systems time to adequately plan for each new standards implementation within the POM cycle.

3.0 Conclusions

Approving the use of the three-digit NATO STANAG 1059 holds significant likelihood of imposing adverse affects upon existing naval systems if forced to comply with this standard. Also, the need to modify existing code, add new source code, and/or introduce middle-ware to accommodate the changes in new releases of STANAG 1059 represents a costly transition process for naval legacy systems. Testbed demonstrations of object-oriented enhancements to the country codes data model might greatly improve Navy's ability to support multiple versions of STANAG 1059 while cost adjustments are submitted through the POM process. Also, a slower implementation path could allow longer transition times so legacy systems have a chance to program the cost of these changes into the out-year POM cycle.

4.0 Recommendation

DMAP makes the following recommendations:

- In the event of NATO ratification of the proposed changes to STANAG 1059, NRL recommends that a more formal examination be conducted to determine those Navy systems using the two-letter STANAG Country code and the impact imposed by these changes.
- Strawman tools and/or extensions should be developed to demonstrate the affects of introducing the three-letter code into legacy systems. These efforts should support procedures to: 1) add new and/or existing source code, 2) add middleware, and/or 3) add a translation file. This might also include investigating more advanced programming techniques, (i.e., OO-based or others) which might be used to generate a new 'Smart Country Codes' data model as a testbed for use in developing future versions of STANAG 1059.

- Further investigation should consider possible improvements needed to the NATO STANAG approval process with reference to minimizing their impact upon Naval systems that are required to adhere to active NATO STANAG. Consideration should be given as well to whether this process circumvents the normal requirement that these systems use the data in accordance with its published NIMA specification.

5.0   Acknowledgements

The Oceanographer of the Navy (N096) funded this technical effort under Program Element 0603704N. It is a follow-up to a call for information made 07 Aug 03 by LCDR William Nisley, N962. The report evaluates the potential for impact upon Navy systems from proposed modifications to the STANAG 1059 Country Codes. DMAP greatly appreciates LCDR Nisley's guidance and encouragement in these technical efforts, as well as the ongoing support of Dr. Edward Mozley, SPAWAR Program Manager. This technical effort represents part of the Naval DMAP's Technical Evaluations Subtask for FY03.

6.0   References

[1] NATO Web Page: http://www.nato.int/docu/handbook/2001/hb140401.htm , NATO, New York, NY, 2003.
[2] Barsh, B. J., Product Specifications for the Digital Aeronautical Flight Information File (DAFIF), Defense Mapping Agency (DMA) St. Louis, MO, PS/1FD/086, 1996.
[3] Barsh, B. J., Page 2, Section 106, Paragraph B1, Product Specifications for the Digital Aeronautical Flight Information File (DAFIF), Defense Mapping Agency (DMA) St. Louis, MO, PS/1FD/086, 1996.
[4] Email (Sterrett, Arthur, SPAWAR Code 150,) (Nisley, W.H. , N962) of 08/07/2003, Subj: Country Codes, Space and Naval Warfare Systems Command, 2003.

7.0   Distribution List

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